Available to Industry and Other Interested Groups

NASA TECHNOLOGY UTILIZATION PROGRAM

USEFUL NEW TECHNOLOGY

National
Aeronautics and
Space
Administration

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INTRODUCTION

Americans and people around the world felt immense pride in man's exploits on the moon. Neil Armstrong's words, "That's one small step for man, one giant leap for mankind," have far larger implications for mankind than a physical step upon the lunar surface. In response to the demanding challenges which led to the "first step" major advances have been realized in the physical sciences and engineering disciplines as well as management sciences. The purpose of the NASA Technology Utilization Program is to increase the return on the public investment in aeronautical and space research and development activities. Scientific and technological advances resulting from these activities are widely disseminated so they may be considered in the solution of technical problems in commerce, industry, education and in areas of national concern, such as health and safety environmental quality, transportation and urban construction. To the extent that these new ideas, innovations, and capabilities are applied the American investment in space and aeronautics will reap an additional dividend.

TECHNOLOGY UTILIZATION PROGRAM
National Aeronautics and Space Administration

HOW SPACE TECHNOLOGY IS AFFECTING YOUR LIFE

The tangible benefits of space technology have been manifold. Industry has utilized developments originating from the space program to improve production processes and product reliability and to provide new nonaerospace products and services to its customers. New products for both business and the consumer have been developed. In other cases individuals benefit directly from the application of space technology. There are major examples of individual benefits in fields such as communications, weather forecasting, medicine, business, management, education, and aeronautics.

Probably one of the most familiar benefits from space research is international television. World-wide sports and news events are now commonplace and are a direct result of the communication satellites developed as a part of the space program. Work on such satellites was initiated by NASA as early as 1958. International television, however, is but one of the many benefits. There has been significant direct economic gain to world commerce. The capacity for transoceanic phone conversations has increased by more than a factor of ten. As a result, communication costs have been cut and long range communications are more practical and reliable.

Another direct application of space technology has been to weather forecasting. High altitude photographs made by satellites contribute significantly to observing weather conditions over vast areas. Satellites watch and photograph every major storm.

Meteorological satellites have been operational for years. Their data are used daily by meteorologists, pilots, and other weather-dependent operators. The US and the USSR are sharing their observations with each other and the rest of the world. NASA is preparing to help the National Oceanic and Atmospheric Administration extend the operating system to synchronous orbit, where continuous observations will be possible. A third-generation low-altitude satellite will replace the present one and add quantitative measurements to provide longer-range weather forecasting.

NASA is preparing to make ecological surveys from orbit, which will produce data on geography and cartography, agriculture and forestry, geology, hydrology, and oceanography. Ecological satellites will aid in predicting floods and snowslides and in the location of natural resources.

Many developments in the space program are being applied to medicine. The solution of many medical problems associated with manned space exploration is leading to new instruments and new medical information of general utility. In the field of medical electronics, NASA-developed telemetry systems are finding broad application. Microminiaturization of medical equipment is also being advanced by the space program. Equipment originally developed by NASA to monitor and transmit physiological data from astronauts in space is finding application in the hospital, clinic, and medical research laboratory. These biotelemetry systems are

EKG Transmitting System . . . a transfer example

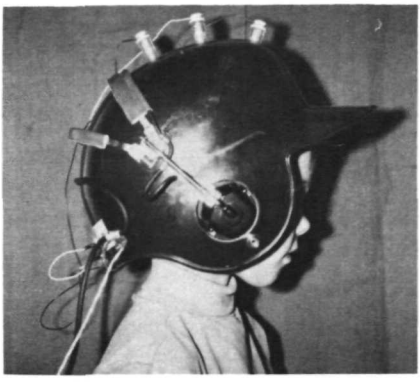
A physician can now obtain electrocardiogram (EKG) data on a patient before he ever sees him. An EKG, taken in the ambulance transferring the patient to the hospital, is transmitted by radiotelemetry direct to the physician who will handle the case. Technology developed at NASA's Flight Research Center, plus interest by physicians and a local ambulance firm in improved patient care, made the development possible. A system of dry, spray-on electrodes is being used in this illustration. The spray-on electrode was announced in a NASA Tech Brief, and is currently on the market. The electronic equipment is commercially available from several sources.

valuable when it is necessary for a patient or experimental animal to be unencumbered by lead wires which interfere with normal activity. Commercial firms are applying this new technology in the manufacture of units for monitoring and transmitting such physiological data as blood pressure, electrocardiograms, electroencephalograms, impedance pneumograms, and electromyograms.

Hospitals are using a NASA-developed automatic surveillance system to monitor tracheotomy| patients. | In | postoperative care of tracheotomy patients, particularly children, there is the ever-present danger of the tube becoming clogged by mucous which would result in suffocation. The constant attention of a nurse is necessary so that corrective action may be taken immediately upon detection of respiratory failure. In the NASA surveillance system, a miniature transmitter is attached directly to the tracheotomy tube. This transmitter senses respiratory difficulty and signals the nurse at a central location by means of an alarm. Constant, individual attention is therefore unneccessary.

NASA scientists developed an ultraminiature capacitance transducer to measure pressures on flight models in wind tunnel tests. Adaptations of this device are being used to measure blood pressure in the heart and blood vessels of humans and experimental animals. The transducer is small enough to mount on a cardiac catheter and can be inserted through an ordinary hypo-

EEG Helmet



An investigator at a southwest clinic is using electroencephalograms (EEG) to diagnose hearing disorders in infants and small children. Special electrodes sense the brainwave pattern. These are mounted in a helmet so that the child cannot disturb them during the measurements. The electrode-helmet system is one developed by NASA for telemetering electroencephalograms of the wearer. Earphones have been added to the helmet to provide the child an auditory stimulus. By observing the response of the EEG signals to such a stimulus, one can determine whether the child hears the sound. It is believed that there are thousands of children today who have become functional mental retardates as a result of hearing difficulties. These deficiencies have prevented auditory interchanges with the environment needed to develop the child's intellect, and the investigator believes that this system will help overcome the problem.

dermic needle into a blood vessel and positioned in the desired location to measure blood pressure without disturbing blood flow.

Computer image processing, the process by which a digital computer is used to enhance selected portions of a vidicon image, was developed by NASA to improve the quality of transmissions from the television cameras on board the Ranger, Mariner, and Surveyor spacecraft. This process can now be used to enhance critical portions of clinical x-rays, providing radiologists and physicians a better diagnostic tool.

These are but a few examples of the role that space technology plays in our lives. Why has the space program made this contribution? The reason is this: Any major, organized effort that requires technical achievement to reach its objective produces new technology applicable to many areas other than the original objective. Over the past few thousand years of civilization the greatest technological advances have occurred as a result of war. The space program is one of the first organized, peaceful efforts producing major technological advances.

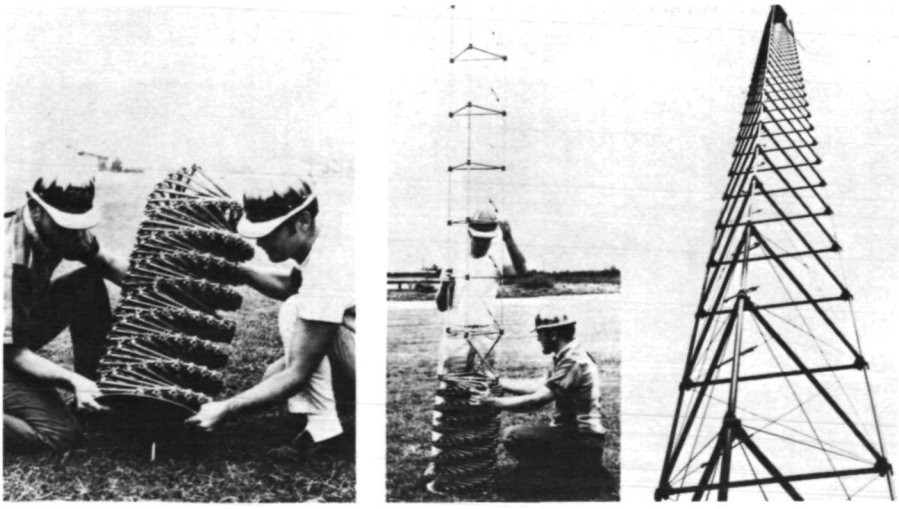
One purpose of the NASA Technology Utilization Program is to assist industry, medicine, government and other interested groups in taking advantage of these advances for the ultimate benefit of the consumer. A few ways in which industry has benefited are illustrated in the next section.

INDUSTRIAL BENEFITS

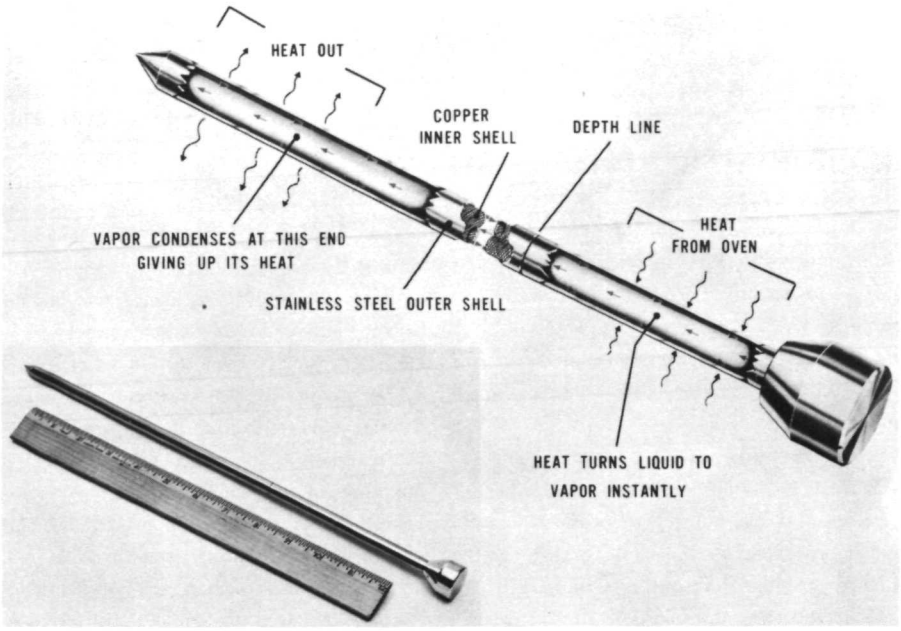
Industry benefits from the Technology Utilization Program by applying space technology to improve production processes, products, and customer services. Thousands of scientists and engineers are producing new technology faster than it can be disseminated by traditional means. As illustrated by the examples below, this technology is often combined with other developments by industry to produce new and improved goods and services. How can this great national resource be tapped by a machine operator in Wisconsin, an educator in Oklahoma, a medical researcher in Boston, and a design engineer in Cleveland? This is the challenge that the NASA Technology Utilization Program was created to meet. Below are just a few of the cases where this challenge was successfully met.

• A California company has adapted results of research for NASA to the design and manufacture of a deployable, lightweight lattice tower which stores very compactly. A 100-foot section weighs only 42 pounds and is easily erected by two men. Strong and rigid, the towers are useful as scaffolding, portable radio antennas, temporary mobile communications systems, instrument or camera supports and other uses in which easy transportability is desired and permanent structures are not required.

• An improved punch and die set, one that can produce especially accurate and strong tubing flares, was developed under a NASA Lewis Research Center contract for fabrication of space vehicles and support equipment. A company has since developed with its own funds a machine incorporating the punch and die. A U.S.



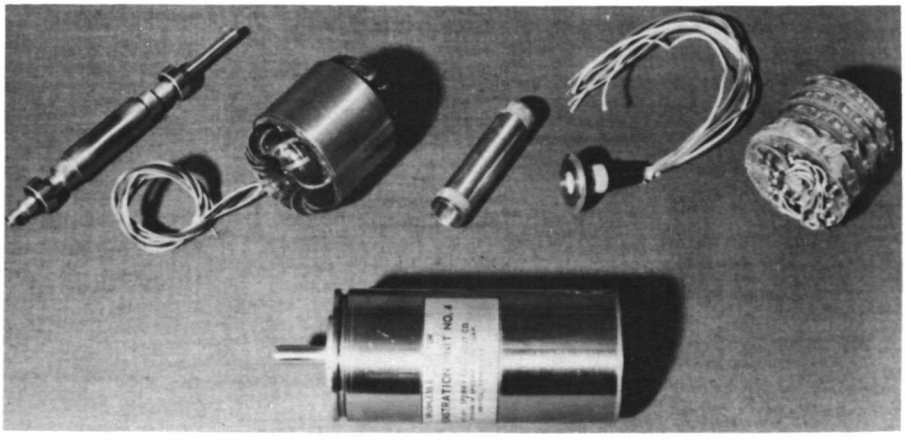
Deployable Lattice Tower



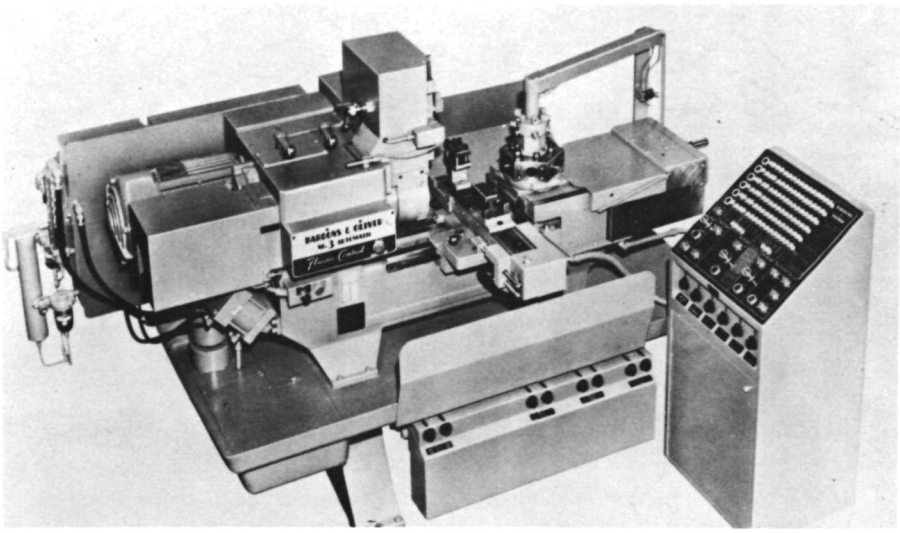
Cooking Pin

patent was obtained for the machine and a license for its manufacture has been granted.

• A small midwest company used the services of a NASA Regional Dissemination Center to help in the design of a new line of miniature heat pipes for the elimination of hot spots in electronic equipment. The company recognized an entirely different application for a device incorporating the heat pipe principle and proceeded to design a cooking pin for use in the kitchen. Inserted in a roast, for example, the device cooks the meat from the inside out while the oven bakes it from the outside. Thus, normal cooking time is



Brushless D.C. Motor



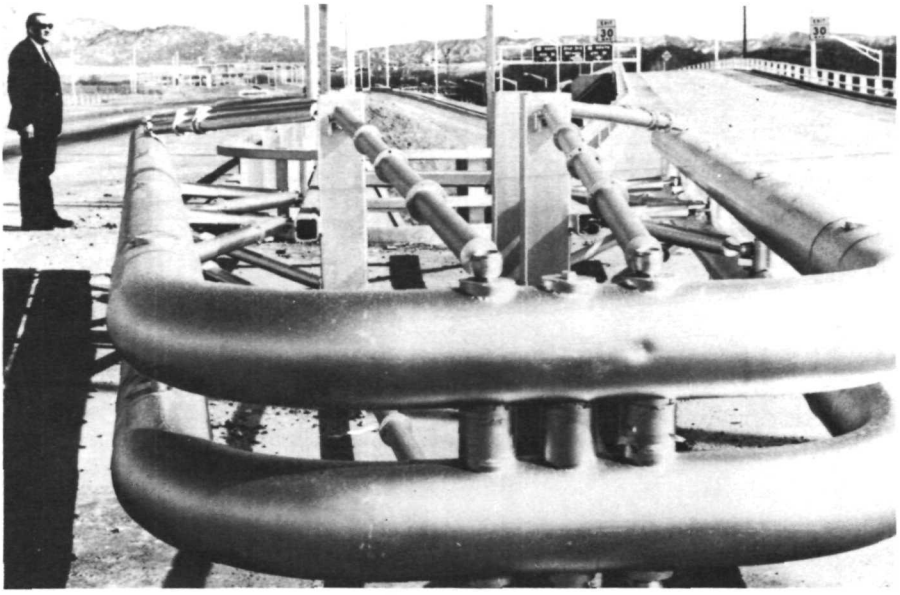
Fluidic Controlled Turret Lathe

reduced by one-half. The cooking pin is available for purchase at retail stores, and the firm expects it to become one of its staple products.

• The problem of communication in space, where silent and maintenance-free operation of electric motors is a necessity, has led to the design of brushless dc motors. Such motors, in both subfractional and fractional sizes, have been developed by several manufacturers who will manufacture on demand for applications in which high reliability, maintenance-free performance and safety factors are primary requirements.

• A machine tool manufacturer, using information received from Lewis Research Center, designed and is now manufacturing a line of fluidic-controlled automatic turret lathes. More than 50 such machines have been sold and the company is enthusiastic over future sales prospects for this special line of turret lathes.

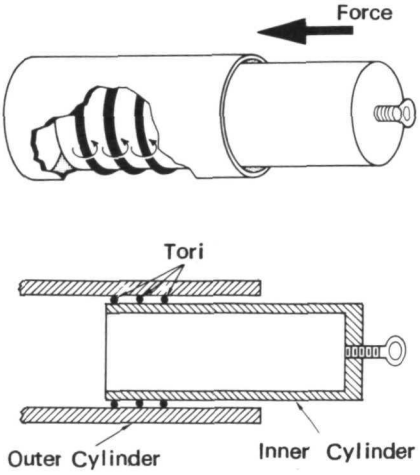
• A major automobile manufacturer is conducting intensive research on a new type of automobile bumper which lessens the effect of direct impacts. The Bureau of Public Roads has tested the same principle in connection with highway guard rails and found that a guard rail can be made which cuts down a 60-mile-per-hour impact to the equivalent of a 5-mile-per-hour impact. These safety developments are based on an astronaut couch shock absorber. The original design as illustrated used an inner tube with O-rings around it fitting tightly into an outer tube. When compressed or extended, the rolling O-rings absorb considerable energy.



An example of a highway barrier is this installation at diverging roadways at Albuquerque, N. Mex. In this system guardrails are attached to mounting posts by devices which consist of multiple-telescoping steel tubing.

New Federal standards require that all 1973 model automobiles be equipped with bumper devices of this kind. Also, monetary benefits to the public may result from reduced collision insurance premiums. One insurance company has announced a reduction in collision insurance premiums for automobiles with bumper devices installed that meet the Federal standards.

These are examples of industrial benefits from space technology. With a storehouse of over 700,000 aerospace-related technical reports growing at a rate of 6000 per month, the future is limited only by the imagination of individuals and industry in the utilization of this technology. The next section summarizes how this technology may be obtained.



Shock Absorber Design

HOW TO OBTAIN NASA TECHNOLOGY

The first step in reaping benefits from the space program is to obtain the information that is relevant to your specific needs. As a part of its Technology Utilization Program, NASA has established many services designed to help pinpoint the right technology for those needs and assist in the application of this technology to industrial and other users.

Extensive screening and selecting of new developments within NASA are necessary before information is disseminated to industry. A special effort is made to single out technology which is likely to have nonaerospace applications. Each of NASA's field installations has a Technology Utilization Officer. He identifies, documents, and evaluates new technology generated by NASA and its contractors. The Technology Utilization Officers can also provide assistance to potential users of new technology. These officers administer a special clause in NASA contracts that requires contractors to report to NASA new technology developed in the course of R & D work. New technology that is thus reported and deemed to have commercial potential is brought to the attention of business and industry through one of the services listed below. Each of the services is more fully described in the next section, "The NASA Technology Utilization Program."

• REGIONAL DISSEMINATION CENTERS offer to fee-paying clients individualized services in retrieving technical information for their specific needs. A list of these Centers is on Page 18.

• APPLICATION TEAMS under contract to NASA directly assist public sector research groups and government agencies in areas such as medicine, air and water pollution, mine safety, law enforcement, housing, and transportation. Individual arrangements must be made for this service. Inquiries may be forwarded to the Director, Technology Utilization Office, Code KT, NASA Headquarters, Washington, D.C. 20546.

• THE COMPUTER SOFTWARE AND MANAGEMENT INFORMATION CENTER (COSMIC) collects, evaluates, and distributes computer programs with nonaerospace applications. Tapes, card decks, program listings, machine-run instructions, and documentation are provided fee-paying clients. Such "software" is announced in *Computer Program Abstracts* and sold by COSMIC at prices based on the cost of reproduction and handling of the programs. For more information, write to the Director, COSMIC, Barrow Hall, University of Georgia, Athens, Georgia 30601.

• TECH BRIEFS, which announce particularly significant NASA developments for the nonaerospace user, are available by subscription from the National Technical Information Service, Springfield, Virginia 22151. The reports, drawings, specifications, and similar documentation related to the invention described in a Tech Brief are available, without charge, by writing to the cognizant NASA Technology Utilization Officer. A 1-year subscription for all

nine categories of Tech Briefs is $20. The average price for a single category is $4. A set of all Tech Briefs issued prior to January 1971 is $110. A Cumulative Index to Tech Briefs is $10.

• REPORTS, SURVEYS, COMPILATIONS, CONFERENCE PROCEEDINGS, and other SPECIAL PUBLICATIONS are also prepared by NASA in order to facilitate the transfer of technology to industry. Some of these publications combine new technological information from many sources into one document for the convenience of the user. Other special publications discuss particularly significant innovations in detail. They are available from the National Technical Information Service (see address above) at prices ranging from $3 to $10. Many of these publications are also sold by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

• ABSTRACT JOURNALS are published semimonthly. *Scientific and Technical Aerospace Reports (STAR)* announces aerospace report literature; *International Aerospace Abstracts (IAA)* covers the published aerospace literature. The U.S. Government Printing Office (see address above) sells single copies of *STAR* for $2.25 and annual subscriptions for $54. The American Institute of Aeronautics and Astronautics, Inc., 750 Third Avenue, New York, N.Y. 10017, accepts annual subscriptions to *IAA* for $75.

• COMPUTER PROGRAM ABSTRACTS is issued quarterly by the NASA Office of Technology Utilization. This periodical announces all computer programs available from COSMIC. An annual subscription may be purchased for $2.75 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

• PATENT LICENSING arrangements may be made with the Assistant General Counsel for Patent Matters, Code GP, NASA Headquarters, Washington, D.C. 20546. Both exclusive and nonexclusive, royalty-free, licenses may be obtained, depending upon the situation.

THE NASA TECHNOLOGY UTILIZATION PROGRAM

NASA collects the results of aerospace-related research and development from all parts of the world. This collection now contains over 700,000 documents which are available for use by individuals and industry working in other areas. The need to disseminate the rapidly growing volume of information resulted in the formation of the NASA Technology Utilization Program. It has four basic purposes:

- To increase the return on the national investment in aerospace research by encouraging additional use of the results of that research.
- To shorten the time gap between the discovery of new knowledge and its effective use in the marketplace.
- To aid the movement of new knowledge across industrial, disciplinary, and regional boundaries.
- To contribute to the development of better means of transferring knowledge from its points of origin to other points of practical application.

The major activities of the NASA Technology Utilization Program are designed to encourage the use of aerospace technology. Specifically prepared publications and dissemination services are among the principal activities of this program.

SPECIAL PUBLICATIONS

Special publications are prepared to facilitate the transfer of aerospace generated technology. They result from the screening of vast quantities of information and the selection of those technological advancements considered of particular significance in specific areas of industry, medicine, and government.

A *Tech Brief* is the most commonly used

Special Publications Report Selected New Developments

medium for announcing innovations resulting from NASA programs. It is a one or two page bulletin concisely describing an innovation and explaining its basic concepts and principles. The Technology Utilization Officers at the various NASA field centers assist in identifying new technology advances resulting from NASA contracts and in-house programs. All relevant reports and background material are available through the Technology Utilization Officer noted on each Tech Brief. Many of the innovations announced in this way are utilized or adapted by industry and applied to nonaerospace products.

Nine categories of Tech Briefs are issued: Electronics/Electrical; Electronic/Electrical Systems; Physical Sciences; Materials/Chemistry; Life Sciences; Mechanics; Machinery, Equipment and Tools; Fabrication Technology; Computer Programs.

TU Compilations collect many innovations in related areas of technology under a single cover. These are collections of brief descriptions of innovations, all in a related field. They are generously illustrated and the compilations provide a workbook on a particular field at the practical level. Examples include "Machine Shop Measurement," "Bonding and Joining Technology," and "Selected Electronic Circuits."

Technology Utilization Reports describe innovations of special significance or complexity. These multi-page documents present information in considerably more detail than Tech Brief announcements. They bear such titles as "Joining Ceramics and Graphite to Other Materials," "Induction Heating Advances; Applications to 5800°F," and "Potting Electronic Modules."

Technology Surveys consolidate the results of NASA-sponsored research and development efforts which have advanced whole areas of technology. Noted authorities on the subject matter write these "guidebooks" for NASA to help others benefit from the accomplishments described. "Magnetic Tape Recording," "Solid Lubricants," "Thermal Insulation Systems," "High-Velocity Metal Working," and "Advanced Valve Technology" are examples of such surveys.

Conference Proceedings are also published to disseminate technology. NASA sponsors several conferences each year for particular industries and groups. At such meetings scientists and engineers who have made major contributions to technology review their work for potential beneficiaries of it in an industrial community. Conferences held on "Pavement Grooving and Traction Studies," "Selected Technology for the Electric Power Industry," and "Materials for Improved Fire Safety" are typical examples.

Computer Program Abstracts is a quarterly periodical available from the Superintendent of Documents, U.S. Government Printing Office, and it announces the availability of complete computer programs. These are programs which have been developed by NASA, AEC and the Department of Defense. They are made available for sale to the public by COSMIC and the Regional Dissemination Centers.

REGIONAL DISSEMINATION CENTERS

New knowledge is acquired in bits and pieces more often than in readily usable packages. To solve a problem in one context, information about research performed for diverse purposes often must be pulled together, applied to the specific situation, and possibly expanded by further study of individual requirements.

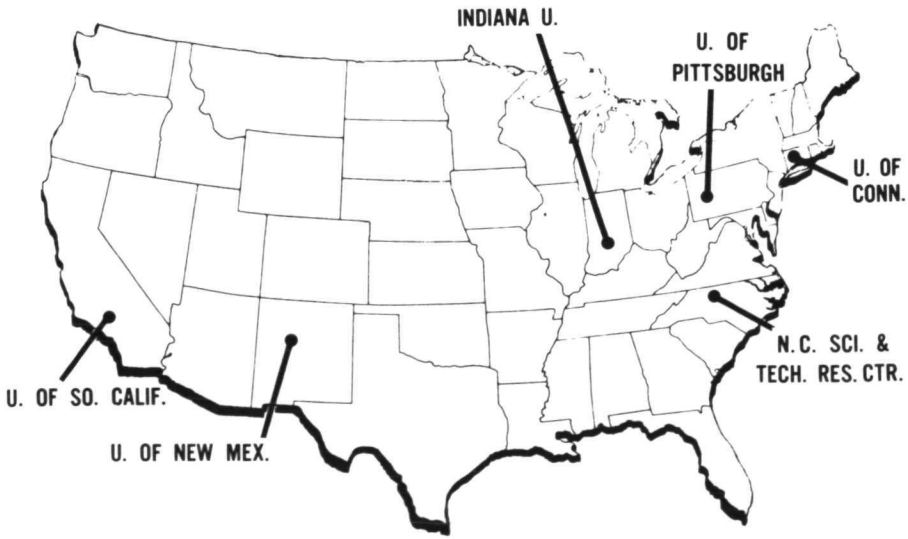
Six Regional Dissemination Centers es-

tablished by NASA help potential users obtain new technology in packages appropriate to their needs. The data base of over 700,000 scientific and technical aerospace reports in computer-searchable form comprise the Centers' primary information resource. This is supplemented by material in areas such as chemistry, engineering, electronics, plastics, and metallurgy.

Although similar, no two of these Centers are alike. Each is based at a university or not-for-profit research organization, and staffed with professional personnel skilled in the use of computer search-and-retrieval techniques to assemble information. These Centers serve fee-paying industrial clients, both large and small, in a variety of ways:

Current Awareness Searches: More than 6000 new citations of scientific and technical reports are searched each month by computer for items of likely value to each client. This is done by machine-matching an "interest profile" of the client's objectives, problems, needs, and desires against document descriptors contained in the RDC data bank. Specialists then screen the citations obtained for relevance to user needs and forward abstracts to the client. The client then may request full copies of whichever documents among those cited that he decides may be useful to him.

Retrospective Searches: Complete searches of the entire file are made in response to clients' specific questions. Computer tapes bearing citations of previous as well



Experimental Regional Dissemination Centers

as the most recent additions to the aerospace library are machine searched. The output is evaluated by the RDC's experts and abstracts are sent to the company or person who posed the question. Documents located in this way are also sent when requested.

Standard Interest Profiles: The regional Centers prepare and use profiles of this type when they have numerous clients with closely related interests. Like ready-made clothing, these profiles reduce the cost to customers who do not require custom-tailored information service.

Special Publications: RDC's send the Technology Utilization Publications described in the previous section to their clients, and supply additional detailed information and back-up data on matters of special interest to them.

Assistance [to] Management: In addition to sifting and providing basic information, the regional centers call attention to developments and trends that may affect both their clients current operations and their long-range plans. More specifically, these services are helpful in:

- Product innovation
- Process improvement
- Cost reduction
- Setting R & D priorities and avoiding duplication
- Continuing education of professional personnel.

Each RDC is responsive to a specific geographic and economic environment. Hence their services and their fees vary. Their addresses are given below, and a prospective client may consult any of them about its offerings and charges.

AEROSPACE RESEARCH APPLICATIONS CENTER (ARAC)
Indiana University Foundation
Bloomington, Indiana 47401
Phone (812) 337-7970

KNOWLEDGE AVAILABILITY SYSTEMS CENTER (KASC)
University of Pittsburgh
Pittsburgh, Pennsylvania 15213
Phone (412) 621-6887

NEW ENGLAND RESEARCH APPLICATION CENTER (NERAC)
University of Connecticut
Mansfield Professional Park
Storrs, Connecticut 06268
Phone (203) 429-5151

NORTH CAROLINA SCIENCE AND TECHNOLOGY RESEARCH CENTER (NCSTRC)
Post Office Box 12235
Research Triangle Park, North Carolina 27709
Phone (919) 549-8291

TECHNOLOGY APPLICATION CENTER (TAC)
University of New Mexico, Box 185
Albuquerque, New Mexico 87106
Phone (505) 277-4000

WESTERN RESEARCH APPLICATIONS CENTER (WESRAC)
809 West 34th Street
University of Southern California
Los Angeles, California 90007
Phone (213) 746-6132

Use of NASA Technology in Criminalistics

A fiber optics scanning device, developed under contract to NASA to detect surface flaws and cracks on space vehicle components, is being applied experimentally to detect indented writing. This is a major problem in the field of criminalistics involving the examination of impressions left on underlying sheets of paper, blotters, or similar materials after writing on overlying surfaces.

APPLICATION TEAMS

NASA's Technology Utilization Program actively introduces aerospace technology into several nonaerospace areas of public concern such as medicine, pollution control, urban construction and planning, transportation, mine safety, and law enforcement and criminalistics. Multi-disciplinary Application Teams have been established under contract to NASA for this purpose and work with mission-oriented institutions, groups, and agencies in areas such as mentioned above. The teams assist in identifying and applying aerospace technology to problems—unmet technological requirements—identified by the mission organization. In seeking solutions to problems, these teams have access to the broad range of technology created in the course of aerospace research and development. Scientists and engineers at NASA installations throughout the U.S. are frequently consulted and are sometimes brought into direct contact with the problem originator. In-depth searches of NASA's computerized data bank are also systematically conducted to maximize chances of locating relevant technology. Technology applications facilitated by the Application Teams have permitted substantial savings in dollars and time and in other cases have provided solutions to problems which may have otherwise remained unsolved.

Additional information concerning Application Team activities is available from the Director, Technology Utilization Office, Code KT, NASA Headquarters, Washington, D.C. 20546.

COMPUTER SOFTWARE AND MANAGEMENT INFORMATION CENTER (COSMIC)

COSMIC was established by NASA so that computer users could benefit from the millions of dollars that NASA has invested in the development of computer programs. The Center collects, evaluates, and distributes tapes, card decks, program listings, and machine-run instructions. Material is collected from NASA, the AEC, and the Department of Defense. Only those items which are operational and of potential value in a wide range of applications are added to COSMIC's inventory. Nearly 1000 complete programs and documentation packages are available. These are sold to potential users at prices determined by the cost of reproduction and distribution. It is estimated that purchasing a program from COSMIC saves 50% to 90% of the cost of developing a similar program on the average. To date nearly 20,000 items have been distributed to the industrial, educational, and business communities.

INTERAGENCY ACTIVITIES

The technology generated by one Federal agency is often found useful to another agency concerned with an utterly different facet of the Nation's welfare. Hence NASA has entered into a number of agreements to help other Government agencies benefit from its research-and-development efforts, and thus to multiply the dividends to the public from expenditures for aerospace research and development.

Cooperative efforts between NASA and the Small Business Administration continue to broaden. Such activity includes seminars, workshops, publications, and other experimental dissemination efforts.

Continuing experimental programs are underway with several other federal agencies. These efforts are directed toward the application of NASA generated technology to technical problems identified within these mission-oriented agencies. The user agencies with which NASA is working include among others: The Law Enforcement Assistance Administration (Department of Justice); the Bureau of Reclamation and the Federal Water Pollution Control Administration (both are in the Department of Health, Education, and Welfare); The Department of Transportation; the Social and Rehabilitation Service (Department of Health, Education, and Welfare); and the Bureau of Mines (Department of Interior).

U. S. GOVERNMENT PRINTING OFFICE : 1971 O - 444-926

PATENTS AND LICENSES

NASA's patents and license regulations are a further aid to the transfer of technology. To encourage the earliest possible commercial use, all inventions owned by NASA for which a patent application has been filed, or that have been patented on behalf of NASA, are available for royalty-free license by American firms. If the invention is not reduced to commercial form within 2 years after a patent has been issued, NASA will make the invention available on an exclusive basis in order to stimulate interest in using it commercially. A few inventions are also available for licensing by foreign firms.

Inquiries concerning NASA patent policy and the licensing of NASA-owned inventions may be directed to the NASA patent counsel at any NASA field installation or to the Assistant General Counsel for Patent Matters, NASA, Washington, D.C. 20546.

WHAT DOES THE FUTURE HOLD?

Examples given earlier illustrate how private industry and others can make profitable use of technology first developed in pursuit of space program objectives. There will be a continuing flow of new technology from both present and future programs. These include future manned missions to the moon, the development of an earth orbital workshop, unmanned space flight in preparation for visiting the planets, and the development of new satellite applications. Any business desiring early benefits from the future technological developments associated with these programs has available to it the services of the NASA Technology Utilization Program. Within this program new developments are continually being sought out, documented, and brought to the attention of industry. In particular, the current awareness searches provided by the Regional Dissemination Centers were designed to fill this need. NASA publications announcing innovations such as the *Tech Briefs*, *TU Compilations*, and *Technology Utilization Reports*, also help fill this need. *Conference Proceedings* and *Computer Program Abstracts* bring to the attention of users new material selected for its potential benefit to industry. Through these means industry can continue to acquire new aerospace technology in a timely manner.

NASA FIELD INSTALLATIONS AND OFFICES

Technology Utilization Officers at NASA Headquarters, Washington, D.C., and at the following NASA field installations, can provide assistance to potential users of new technology.

Ames Research Center
Mountain View, Calif. 94035

Flight Research Center
Edwards, Calif. 93523

Goddard Space Flight Center
Greenbelt, Md. 20771

Kennedy Space Center
Kennedy Space Center, Fla.
32899

Langley Research Center
Hampton, Va. 23365

Lewis Research Center
Cleveland, Ohio 44135

Manned Spacecraft Center
Houston, Tex. 77058

Marshall Space Flight Center
Huntsville, Ala. 35812

NASA Pasadena Office
4800 Oak Grove Dr.
Pasadena, Calif. 91103

Wallops Station
Wallops Island, Va. 23337

AEC–NASA Space Nuclear Systems
Office
US AEC Building
Germantown, Md. 20545